CLAIMS

1. A lithium electrochemical cell battery (10; 12; 14) comprising at least one positive electrode (5, 6), at least one liquid electrolyte comprising at least one lithium salt, and at least one negative electrode (1, 2), said battery (10; 12; 14) being characterized in that it comprises at least one layer (3; 13) of a gelled separator GS comprising at least one polymer GP, able to be gelled by the liquid electrolyte, which is at least partly gelled by the liquid electrolyte, in contact with the negative electrode (1, 2), and in that it includes at least one layer (4) of a plasticized separator PS comprising at least one polymer PP, able to be plasticized by the liquid electrolyte, which is in contact with the layer (3; 13) of separator GS.

2. The battery as claimed in claim 1, such that the separator PS layer (4) is at least partly in contact with the positive electrode (5, 6).

3. The battery as claimed in claim 1, comprising, in addition, another separator GS layer (15), called GS_a, at least partly between the positive electrode (5, 6) and the separator PS layer (4).

4. The battery as claimed in one of claims 1 to 3, in which the polymer PP is chosen from the group formed by polyvinylidene fluoride PVDF, polystyrene PS, polyvinyl chloride PVC, polycarbonate PC, ethylene-propylene-diene monomer EPDM, and derivatives thereof; preferably, the polymer PP is chosen from a group formed by polyvinylidene fluorides PVDFs and (polyvinylidene fluoride)-co-(hexafluoropropylene) PVDF-HFP copolymers, and even more preferably the polymer PP is a PVDF-HFP.

5. The battery as claimed in one of claims 1 to 4, in which the polymer GP is chosen from the group formed by polymethyl methacrylate PMMA, polyethylene oxide PEO and polyacrylonitrile PAN, and derivatives thereof; preferably, the polymer PG is PEO.

6. The battery as claimed in one of claims 1 to 5, in which the positive electrode (5, 6) comprises carbon, active material, polymer PP and optionally at least one plasticizer.

7. A process for manufacturing a lithium electrochemical cell battery (10; 12; 14) comprising at least one positive electrode (5, 6), at least one liquid electrolyte comprising at least one lithium salt, and at least one negative electrode (1, 2) comprising an assembly of at least one layer (3; 13) of gelled separator GS, comprising at least one polymer GP, able to be gelled by the liquid electrolyte, on the negative electrode (1, 2), of at least one layer (4) of plasticized separator PS, comprising at least one polymer PP, able to be plasticized by the liquid electrolyte, on said separator GS layer, and optionally of at least one other layer (15) of gelled separator GS, called GS_a, comprising at least one polymer GP, on said separator PS layer (4), the combination of these two or three layers constituting a separator between the negative electrode (1, 2) and the positive electrode (5, 6), an assembly of said separator on the positive electrode (5, 6), and an impregnation of said separator by the liquid electrolyte.

8. The process as claimed in claim 7, in which the positive electrode (5, 6) is manufactured in solution from polymer PP, carbon, active material, plasticizer and solvent.

9. The process as claimed in claim 7, in which the positive electrode (5, 6) is manufactured by extrusion

from polymer PP, carbon, active material and plasticizer.

10. The process as claimed in one of claims 7 to 9, in which the separator PS layer (4) is manufactured in solution from polymer PP, plasticizer and solvent.

11. The process as claimed in one of claims 7 to 9, in which the separator PS layer (4) is manufactured by extrusion from polymer PP, plasticizer or liquid electrolyte.

12. The process as claimed in one of claims 7 to 11, in which the separator GS layer (3; 13; 15) is manufactured in solution from polymer GP, solvent and optionally plasticizer.

13. The process as claimed in one of claims 7 to 11, in which the separator GS layer (3; 13; 15) is manufactured by extrusion from polymer GP, and optionally plasticizer or liquid electrolyte.

14. The process as claimed in one of claims 7 to 13, in which the polymer PP is generally filled with at least one mineral compound chosen from the group formed by MgO, SiO_2, Al_2O_3, TiO_2, $BaTiO_3$, LiI and $LiAlO_2$.

15. The process as claimed in one of claims 7 to 14, in which the polymer GP is generally filled with at least one mineral compound chosen from the group formed by MgO, SiO_2, Al_2O_3, TiO_2, $BaTiO_3$, LiI and $LiAlO_2$.

16. The process as claimed in one of claims 7 to 15, in which the two or three PS and GS layers are joined together into a separator by hot lamination or hot calendering.

17. The process as claimed in one of claims 7 to 15, in which said layers form a three-layer separator (3;

4; 15) obtained by passing the separator PS layer (4) into a solution of polymer GP, or into a solution of liquid electrolyte in which the polymer GP has been dissolved.

18. The process as claimed in one of claims 7 to 16, in which said layers form a bilayer separator obtained by passing a separator PS layer (4), preassembled with the positive electrode, into a solution of polymer GP or into a solution of liquid electrolyte in which the polymer GP has been dissolved.

19. The process as claimed in one of claims 7 to 18, in which the positive electrode (5, 6) and the separator are generally joined together by hot lamination or hot calendering in order to form a plastic complex.

20. The process as claimed in one of claims 7 to 19, in which the plasticizer(s) optionally present in the positive electrode (5, 6)/separator assembly is (are) removed by washing or vacuum extraction so as to obtain an assembly containing virtually no plasticizer.

21. The process as claimed in one of claims 7 to 20, in which the separator/positive electrode (5, 6) assembly, preferably containing virtually no plasticizer, is generally brought into contact with the negative electrode (1, 2) by a lamination or calendering step.

22. The process as claimed in one of claims 7 to 21, in which the plasticizer optionally present is chosen from the group formed by PEO oligomers, dibutyl phthalate (DBP) and propylene carbonate (PC).

23. The process as claimed in one of claims 7 to 22, in which the polymer PP is chosen from the group formed by polyvinylidene fluoride PVDF and (polyvinylidene

fluoride)-co-(hexafluoropropylene) PVDF-HFP; preferably, the polymer PP is PVDF-HFP.

24. The process as claimed in one of claims 7 to 23, in which the polymer GP is chosen from the group formed by polyethylene oxide PEO and polyacrylonitile PAN, and derivatives thereof; preferably, the polymer GP is PEO.

25. The use of a battery (10; 12; 14) as claimed in one of claims 1 to 6 or manufactured according to the process of one of claims 7 to 24 for a hybrid vehicle, an electric vehicle, or for a stationary or portable equipment application.